REMARKS

Claims 1-16 are pending. Claims 3, 6, 9, and 13-16 have been withdrawn from consideration pursuant to the previous restriction requirement. Applicants have carefully considered the December 8, 2005 Office Action, and the comments that follow are presented in a bona fide effort to address all issues raised in that Action and thereby place this case in condition for allowance. Entry of the present Request for Reconsideration is respectfully solicited. It is believed that this response places this case in condition for allowance. Hence, prompt favorable reconsideration of this case is solicited.

Claim 1-2 and 10 were rejected under the first and/or second paragraphs of 35 U.S.C. § 112. The Examiner asserts that the claim term "austenitic grain number" does not appear to be an internationally recognized standard. Applicants respectfully request reconsideration and withdrawal of the rejections in view of the accompanying technical publication (Appendix) and following remarks.

As to the phrase "austenite grain number" in claims 1 and 10, Applicants submit concurrently herewith, an English language version of the Japanese Industrial Standards (JIS - 1998), entitled "Methods of austenite grain size determination for steel". Accordingly, the term as recited in claims 1 and 10 is internationally recognized and one having ordinary skill would have understood meaning of the known standard. Reconsideration and withdrawal of the rejections are respectfully solicited.

Claims 1-2, 4-5 and 10-11 were rejected under 35 U.S.C. § 102(e) as being anticipated over Maeda et al. (U.S. Pat. No. 6,423,158, hereinafter "Maeda"). In the statement of the rejection, the Examiner refers to Maeda, applying the disclosure of a structure corresponding to that defined in

independent claims 1, 4 and 11, as well as dependent claims 2, 5 and 10. With respect to independent claims 4 and 11, the Examiner asserted that the claimed fracture stress value is an inherent characteristic of Maeda's steel structure. Applicants respectfully traverse.

In the present invention, steel is carbo-nitrided at a temperature exceeding an A1 transformation point and then cooled to a temperature of less than the A1 transformation point, and subsequently reheated to a range of temperature higher than the Al transformation point and is quenched. The temperature of reheating is a range of 790°C to 830°C. This is described on page 4, lines 6 to 10 and on page 7, lines 2 to 25 of the English specification.

Maeda describes a method of thermal treatment in which steel that contains C: 0.8-1.5%, Si: 0.4-1.2%, Mn: 0.8-1.5% and Cr: 0.8-1.8% is used as a source material, which is carbonitrided and then quenched and tempered. The quench starts at 830-880°C.

When the present invention and Maeda are compared, it is found that they start quenching at different temperatures. More specifically, the former starts to quench steel at 790-830°C, whereas the latter does so at 830-880°C. If they quench the same material, the one that starts quenching the material at a higher temperature provides retained austenitic having a larger grain size. Thus, Maeda provides retained austenite having a grain size corresponding to 830-880°C and hence smaller than a grain size number of 10.

In contrast, the present invention cools carbonitrided steel to a temperature lower than an Al transformation point to reset (or remove) austenite grains generated in carbonitriding, and starts to quench the steel at a low temperature range of 790°C to 830°C, which provides austenite grains having a size corresponding to 790°C to 830°C and hence falling within a range exceeding a grain size number of 10, as required in independent claims 1 and 10. Accordingly, Maeda fails to identically disclose or suggest every limitation of independent claims 1 and 10. *In re*

Rijckaert, 9 F.3d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993); *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 221 USPQ 481 (Fed. Cir. 1984).

In view of the foregoing differences between Maeda and the present claimed subject matter, Applicants submit that the Examiner's reliance on the doctrine of inherency with respect to the claimed fracture stress value (claims 4 and 11) is misplaced. There is no factual basis to support the Examiner's assertion and it is well established that inherency requires certainty not speculation. *Crown Operations International Ltd. v. Solutia Inc.*, 289 F.3d 1367, 62 USPQ2d 1917 (Fed. Cir. 2002). Applicants submit that Maeda does not disclose or suggest a fracture stress value of no less than 2,650 MPa and, therefore, fails to identically disclose or suggest every limitation of independent claims 4 and 11.

In view of the foregoing, the rejection of claims 1-2, 4-5 and 10-11 under 35 U.S.C. § 102(e) is not legally viable and should be withdrawn.

Independent claims 7 and 12 were rejected under 35 U.S.C. § 102(e) as being anticipated over Takemura et al. (U.S. Pat. No. 6,440,232, hereinafter "Takemura"). In the statement of the rejection, the Examiner refers to Takemura at Table 2 (cols. 9-10), applying the disclosure of a structure corresponding to that defined in independent claims 7 and 12. The Examiner states that Takemura discloses a hydrogen content of no more than 0.5 ppm at Examples 8-10 in Table 2. Applicants respectfully traverse.

The hydrogen content recited in independent claims 7 and 12 is obtained by measuring non-diffusible hydrogen alone, rather than diffusible hydrogen. This is described in the present specification at page 4, lines 23-25.

In contrast, Takemura's Table 2 indicates an amount of hydrogen dispersed. It does **not** indicate a hydrogen content obtained by measuring non-diffusible hydrogen. Therefore, Takemura fails to identically disclose or remotely suggest every limitation of claims 7 and 12.

Furthermore, Takemura's thermal treatment method subjects specimens to carbonitriding heating hardening in an atmosphere of endothermic gas, enriched gas and ammonia gas at a temperature of from 920 to 960°C. Thereafter, the specimens are allowed to cool and cleansed. The specimens are then heated (through hardening) for 0.5 to 3 hours up to 830 to 870°C in an atmosphere of endothermic gas and then oil quenched (hardened). Subsequently, the specimens were cleansed and thereafter heated for 1 to 5 hours in the atmosphere of the air at a temperature in a range of from 160 to 200°C and then cooled (tempered).

When the present invention and Takemura are compared, it is found that they start quenching at different temperatures. More specifically, the former starts to quench steel at 790-830°C, whereas the latter, does so at 830-870°C. Thus, Takemura does not provide an austenite grain exceeding a grain size number of 10. As a result, it does not provide a non-diffusible hydrogen content of no more than 0.5 ppm.

In view of the foregoing, the rejection of claims 7 and 12 under 35 U.S.C. § 102(e) is not legally viable and should be withdrawn.

Dependent claim 8 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Takemura in view of Maeda. Applicants respectfully traverse. Applicants incorporate herein the arguments previously advanced in traversal of the rejection under 35 U.S.C. § 102(b) predicated upon Takemura Dependent claim 8 is free from the applied art in view of its dependency from claim 7. The rejection of claim 8 under 35 U.S.C. § 103(a) is not legally viable and should be withdrawn

It is believed that the pending claims are now in condition for allowance. Applicants therefore respectfully request an early and favorable reconsideration and allowance of this application. If there are any outstanding issues which might be resolved by an interview or an Examiner's amendment, the Examiner is invited to call Applicants' representative at the telephone number shown below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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JIS

JAPANESE INDUSTRIAL STANDARD

Translated and Published by
Japanese Standards Association

JIS G 0551 : 1998

Methods of austenite grain size determination for steel

ICS 77.040.99; 77.080.20

Descriptors : austenitic steels, steels, ferrous metals, ferrous alloys, grain size

Reference number : JIS G 0551 : 1998 (E)

e) **fine grain steel and coarse grain steel** Steel with a grain size number equal to or greater than No. 5 shall be considered to be fine grain steel, and steel with a grain size number less than No. 5 shall be considered to be coarse grain steel. Unless otherwise specified, the distinction between fine grain steel and coarse grain steel shall be made, as a rule, by the testing method of carburized grain size specified in 5.

(f) **mixed grain** Mixed grain means the state of unevenly distributed grains with sizes varying from the grain size number having the maximum frequency to those generally equal to or larger than 3 in one visual field, wherein these grains take up approximately 20 percent or more of the total area, or there exists a visual field wherein may observed different grain size numbers of 3 and above.

Table 1 Grain Size Number

Grain size number G	Number of grain size per mm² m	Mean area of grain size mm²
−3	1	1
−2	2	0.5
−1	4	0.25
0	8	0.125
1	16	0.062 5
2	32	0.031 2
3	64	0.015 6
4	128	0.007 81
5	256	0.003 90
6	512	0.001 95
7	1 024	0.000 98
8	2 048	0.000 49
9	4 096	0.000 244
10	8 192	0.000 122

Remarks: The following formula is concluded in Table 1.

$$m=8\times2^{G}$$

Attached Fig. 1 is the reference charts of 100 magnifications, where this relationship is figured.

4 Classification of testing methods Testing methods and applicable types of steel shall be as described in Table 2. The procedures in Annex 1 shall be used when Bechot- Beaujard method which etches the sample with picric acid aqueous saturated solution in accordance with the agreement between purchaser and the supplier.